

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of)	
)	
Preserving the Open Internet)	GN Docket No. 09-191
)	
Broadband Industry Practices)	WC Docket No. 07-52

**COMMENTS OF GEORGE OU,
POLICY DIRECTOR WITH DIGITAL SOCIETY**

Preserving the open and competitive bandwidth market

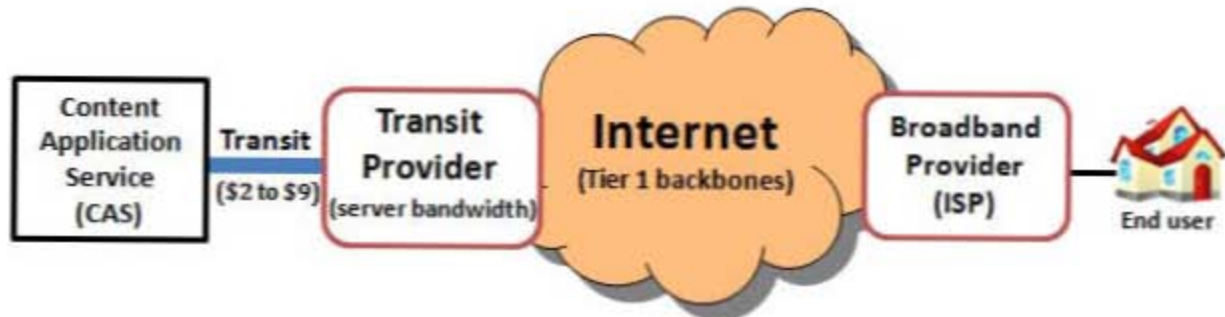
Something unfortunate happened in the search for Net Neutrality and an "open Internet". We have essentially been asked to suspend economic reason and accept the premise that the commodity of Internet server bandwidth is not a free market but a low-cost fixed rate service. We are told by proponents of Net Neutrality that the Internet is a place where the smallest websites that might pay tens of dollars per month for Internet connectivity have the same capability as the largest websites that pay millions per month for Internet connectivity. "Equal access for equal payment" has been replaced with "equal access for any payment". By trying to "preserve" a vision of the Internet that never even existed, Net Neutrality would eliminate the existing open and competitive Internet server bandwidth market.

The server bandwidth market has existed since the beginning of the commercial Internet. Businesses seeking to have a significant presence on the Internet meet at Internet Exchange Points (IXPs) which are large data centers that offer connectivity between Content, Application, Service (CAS) providers and network providers of all sizes and shape. These IXPs act as a type of open market for server bandwidth where content providers have a multitude of providers to pick from to get the best rates. Network operators can peer (trade) or buy bandwidth from one another, and CAS providers can buy bandwidth from network operators or even negotiate peering agreements for free or for a fee that they deem cost effective.

But because we are told by Net Neutrality proponents that some network operators (notably those who provide broadband services) must not be permitted to sell and become "gateways" to the Internet, and because we are told that connectivity must have the same capability regardless of cost, we are in danger of losing the open and competitive bandwidth market in the server

space. The current draft of the FCC's proposed "Net Neutrality" NPRM regulations to include rules that would forbid broadband providers from charging Content, Application, or Service (CAS) providers for "**enhanced or prioritized**" access to broadband consumers. Paragraph 106 of the draft FCC NPRM¹ "Net Neutrality" rules is notably vague and open ended that no one is clear what the rule covers which means there is a good chance that it will eliminate a number of affordable and effective ways of purchasing bandwidth that CAS providers can currently choose from. That means Net Neutrality will have the opposite effective of increasing the cost of Internet connectivity for businesses and reduce innovation on the Internet.

Option 1: Traditional Internet connectivity model

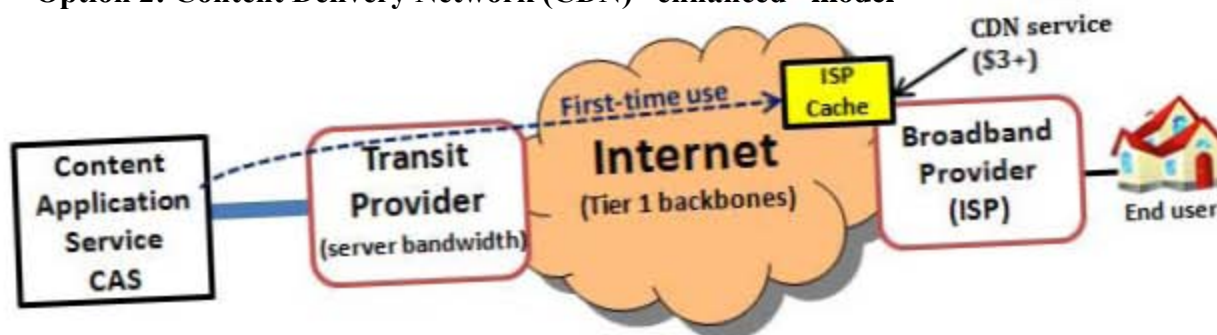


The traditional (and still common) way of gaining a presence on the Internet for businesses is to buy dedicated "transit" bandwidth from an Internet Service Provider (ISP) at a data centers. This is the method that most businesses are familiar with. Transit service is a convenient "one stop shop" that allows a business to reach any part of the Internet, but it is one of the more expensive forms of bandwidth because the data being transmitted has to incur the cost of the transit ISP and the Internet backbone which is expensive since it is effectively a leased global network. Typical 2009 costs for transit bandwidth ranges from \$2 to \$9 per Megabit per second (Mbps) per month depending on the commitment level (quantity discounts). So a small 100 Mbps transit circuit at a data center might cost \$900 per month, and a big 10,000 Mbps transit circuit might cost \$40,000 per month in the United States.

The performance and reliability of transit connections are limited because of the complex arrangement of the network. Any congestion within the transit provider or Internet backbone or the broadband provider, and especially the interconnections between these three infrastructure entities will reduce the performance of data going from the CAS provider to the End User. Any connectivity problems within or between any of these infrastructure entities will cause the End User to lose access to the CAS provider and there nothing the CAS or End User can do but wait for the problem to get repaired. At certain times when some key interconnection circuit goes down or if there is a peering dispute within the cloud, some connections can be lost for hours to several days.

Note: Hosting servers outside of data centers is more expensive because it incurs last-mile lease lines charges in addition to the transit charges. Residential broadband service is cheap but it is inappropriate for hosting content because the bandwidth is shared at a typical ratio of 20:1 to 40:1, and the Terms of Service (ToS) for broadband don't accommodate servers.

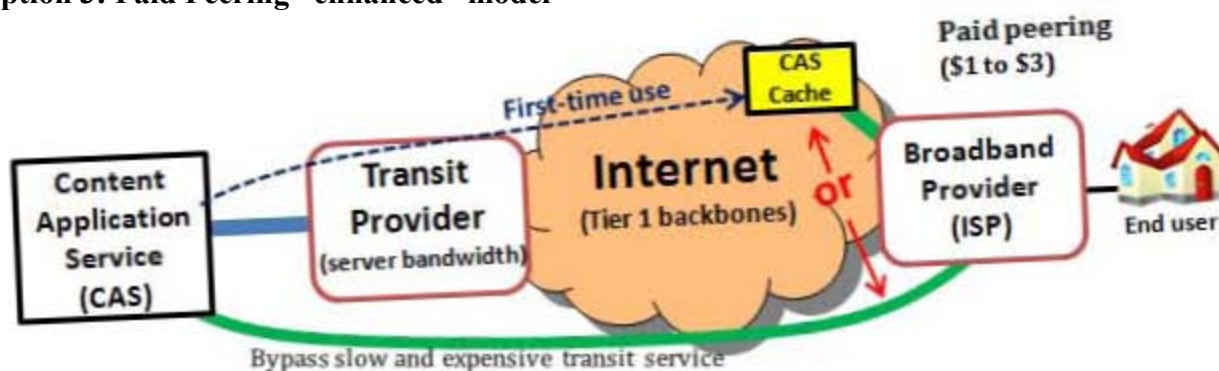
Option 2: Content Delivery Network (CDN) “enhanced” model



In the last decade of the Internet, the emergence of Content Deliver Networks (CDNs) like Akamai and Limelight has changed the way that popular high bandwidth content (mostly video) gets delivered to the End Users. CDN is an even more convenient one stop shop than transit service because not only does it provide a global distribution network for a business' bandwidth needs, it also offloads their server and IT infrastructure requirements. So for this reason, CDN services (at similar commitment levels) are almost always going to be more expensive than just transit bandwidth costs alone, but CDN providers argue that it may still be cheaper overall because a business doesn't need to build out their own server and data center infrastructure or hire engineers to design, build, and operate the network. For businesses that don't necessarily have the ability or will to handle everything on their own, CDN services make sense. For other larger content providers who have the scale to justify their own IT infrastructure, they may choose to go other routes.

But more recently, broadband providers are trying to get into the CDN market as well. They may or may not provide a one stop shop with global reach, but they might be able to offer competitive rates and potentially some other performance benefits as well. Businesses looking for CDN services can ignore these ISP CDN providers, completely switch over to one of them, or partially switch over to them while simultaneously using one of the more traditional CDN providers. The nice thing about having the broadband providers compete in the CDN market is that it puts pricing pressure on the few dominant CDN providers like Limelight and Akamai. But the currently proposed FCC NPRM Net Neutrality regulations prohibit broadband providers from offering CAS providers "enhanced" services, and that would eliminate competition in the CDN market which ultimately produces the opposite effect intended by the NPRM.

Option 3: Paid Peering “enhanced” model



Another more recent innovative way of buying server bandwidth on the Internet is the Paid Peering model. Instead of paying \$3 to \$9 per Mbps per month for transit connectivity, CAS providers can directly peer with the broadband network they're trying to deliver content to and only pay \$1 to \$3 per Mbps per month. These Paid Peering services only offer specific connectivity to the broadband provider's network and not global connectivity, but it offloads the traffic that would have had to go over the more expensive transit service and therefore saves the CAS provider money. So a CAS provider would simultaneously use their transit service to reach destinations that they don't directly peer with and they would use the Paid Peering services to reach specific destinations.

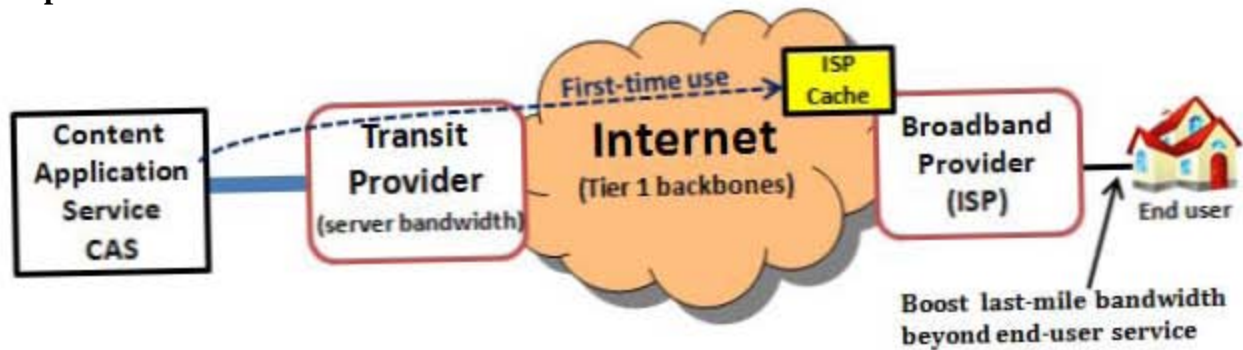
Furthermore, all the performance and reliability problems of transit services vanish because of the shorter and more direct method of connection. We have real-world testimony of this from CAS providers who have experienced 2-3 times better performance with Comcast's Paid Peering product and others who were able to overcome routing problems by switching to Paid Peering². The technical support provided by Paid Peering services are also said to be superior.

Despite the obvious benefits of Paid Peering, the proposed FCC NPRM Net Neutrality rules would prohibit broadband providers from offering these "enhanced" services to CAS providers. That would have brutal consequences for nearly all CAS providers that are not "hyper giants" because it would force them to buy slower and more expensive transit services. It would effectively prohibit CAS providers from buying cheaper and better wholesale bandwidth.

Internet "hyper giants" like Google don't care for Paid Peering because they have such a large private Internet infrastructure and they account for 7% of all Internet traffic³. That leverage allows them to negotiate free peering agreements with many ISPs and the elimination of Paid Peering products would only give them even more leverage to negotiate free peering agreements with the few ISPs that are holding out for Paid Peering agreements, and it would simultaneously restrain their smaller competitors in the CAS provider market who can't possibly negotiate free peering deals which would ensure Google's dominance.

Note: Google can get free peering because they have such a massive infrastructure of their own that they have built and paid for and because they have so much clout to negotiate. If anyone could get free peering, no one would ever pay for Internet bandwidth again which would mean an economic collapse in the Internet economy since only the Internet Peering Exchanges can extract revenue. But IXPs don't pay the bulk of the Internet's infrastructure costs such as the long haul cross country and intercontinental circuits or the millions of last-mile connections, the IXPs only pay to interconnect and house the various players in the relatively inexpensive data centers. CAS providers don't build out the expensive infrastructure which is why they have to pay to peer. Furthermore, ISPs and broadband providers also get no ad revenue from content traffic and ISPs don't get revenue from End Users because Broadband services are flat rate. CAS providers on the other hand get revenue for every bit that their servers deliver to the End Users. The only way that ISPs and Broadband providers can get any revenue for building out infrastructure is to charge for transit, peering, or broadband connectivity. A world with free on-ramps for CAS providers is simply not economically viable.

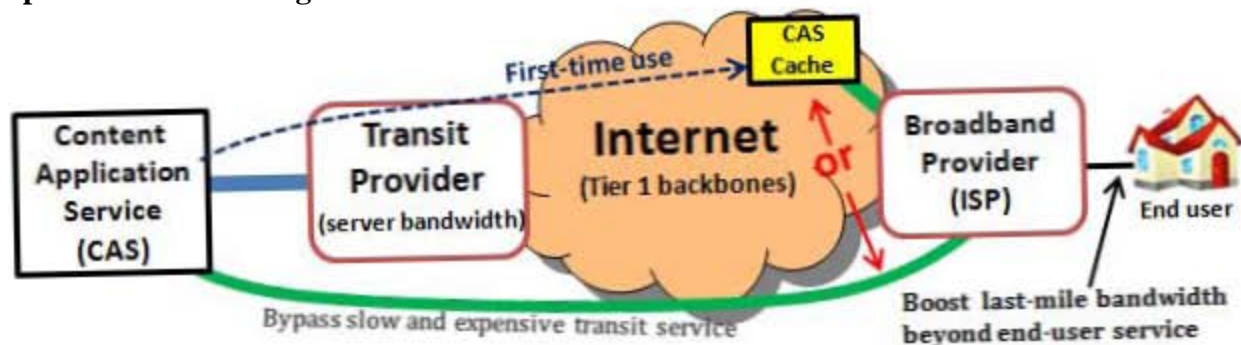
Option 4: CDN model with last-mile bandwidth boost



Another innovative model that ISPs could offer is a caching service similar to option 2 above that also provides bandwidth guarantees to End Users. So if a content provider wants to deliver content to End Users at 8 Mbps but some End Users only paid for 3 Mbps broadband connectivity, the ISP could temporarily boost the performance of those lower tier End Users to 8 Mbps. The CAS provider would pay for the bandwidth boost of the End User (similar to how an online retailer could offer free shipping to consumers when they buy a product), and the consumer would benefit from the lower shipping rates that the CAS provider can negotiate. The same last-mile bandwidth boost capability could also be offered to CDN retailers like Akamai and Limelight so that they can also offer the same capability to their customers.

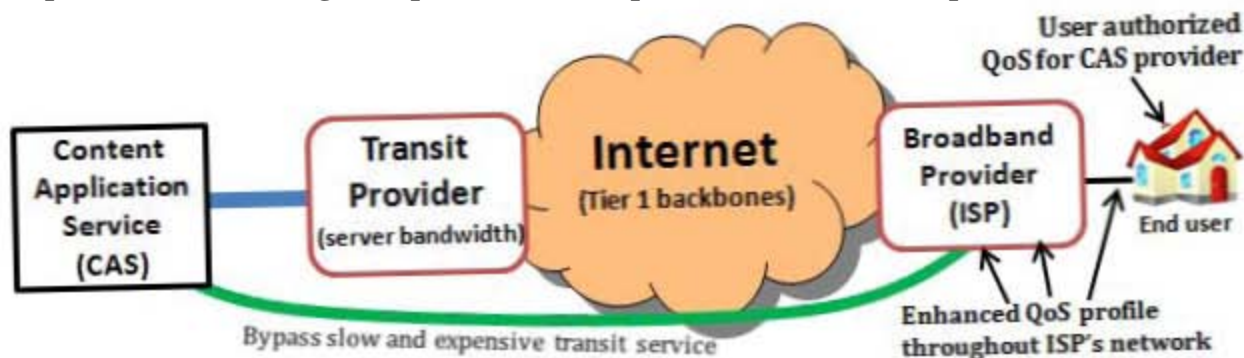
The concept of CAS provider paying for End User access is nothing new and it is the model used by the Amazon Kindle e-book reader and a number of alternatives that are coming onto the market this year. Unfortunately, this type of enhanced service may run afoul of the proposed FCC Net Neutrality rules and that would eliminate the open bandwidth market and stifle innovation on the Internet.

Option 5: Paid Peering with last-mile bandwidth boost



Another innovative approach is an enhanced Paid Peering model that also boosts last-mile bandwidth. Similar to Option 3 above, this model could also provide a last mile bandwidth boost paid for by the CAS provider. Again, the same last-mile bandwidth boost capability could also be offered to CDN retailers like Akamai and Limelight so that they can also offer the same capability to their customers. Again, the FCC NPRM would threaten this enhanced service.

Option 6: Paid Peering with prioritized QoS profile (with end user opt-in)

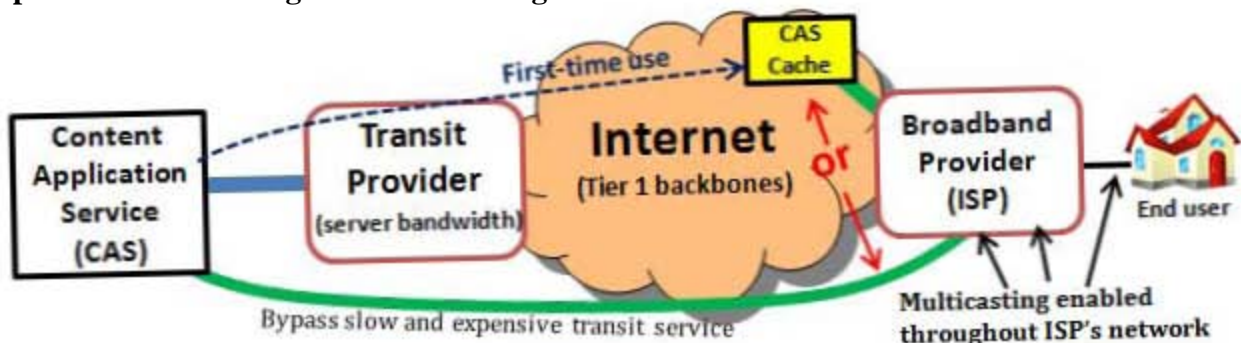


Another variation on Option 3 is a Paid Peering service with a prioritized QoS profile. This type of service wouldn't use a caching infrastructure since it involves real-time low latency applications like gaming, and it's typically a low bandwidth service since online gaming uses less than 100 Kbps each direction whereas video content is 300 Kbps to 8000 Kbps. Blizzard Entertainment for example has a partnership with Nordic based ISP and broadband provider TeliaSonera that includes a prioritized QoS profile which provides low-latency Internet connectivity⁴.

Since many feel that ISPs shouldn't decide what traffic gets prioritized and what doesn't and that only the end-points (the user and content provider) should decide, the prioritization (especially over the last-mile network where it is most noticeable and effective) should be something that the end points asked for. But this can be handled through clear disclosure and the user would be informed that when they purchase the service, they're also purchasing and approving the prioritized data access which would give them superior. The first time the End User uses the service, they're informed of the packet prioritization taking place and they have to opt into the service. That means both the end points not only approve of the prioritization taking place in the network, but they're actually paying for it.

With near certainty, the proposed FCC Net Neutrality rules would threaten this type of **"enhanced and prioritized"** service even though it is being asked for by the End User and the CAS provider. But who exactly is the NPRM supposed to be protecting if not the wishes of the End User and CAS provider?

Option 7: Paid Peering with multicasting



Lastly, another innovative technology is multicasting which allows information to be sent once to millions of users one time rather than millions of times. We can imagine another variation of Paid Peering that facilitates multicasting. This solution is extremely scalable and efficient for wired and even wireless broadband networks and it is less expensive for the CAS provider because it incurs less bandwidth consumption in all parts of the network. Yet the currently proposed FCC NPRM Net Neutrality rules seem to prohibit this type of "enhanced" and innovative network architecture.

Conclusion

Innovation on the Internet is too precious to stifle and the FCC must carefully examine all the ramifications of their proposed regulations. It must move beyond flawed Net Neutrality economic studies⁵ and have a thorough look at the facts. This paper hopefully provides a useful starting point for debating the merits of "enhanced and prioritized" services.

¹ Draft of proposed FCC NPRM "Net Neutrality" regulations, Federal Communications Commission, http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-09-93A1.pdf

² William Norton, "Review of Comcast Paid Peering", Ask Dr. Peering, November 12, 2009, http://www.drpeering.net/a/Ask_DrPeering/Entries/2009/11/12_Comcast_Paid_Peering_Reviews.html

³ "Two-year study of global Internet traffic", Arbor Networks, October 13, 2009, <http://www.arbornetworks.com/en/arbor-networks-the-university-of-michigan-and-merit-network-to-present-two-year-study-of-global-int-2.html>

⁴ Press release, "TeliaSonera renews IP-transit and hosting agreement with Blizzard Entertainment, Inc. For online games", TeliaSonera.com, May 18, 2009, <http://www.teliaSonera.com/press/pressreleases/item.page?prs.itemId=426937>

⁵ George Ou, "Net Neutrality economic study based on flawed analysis", Digital Society, January 14, 2010, <http://www.digitalsociety.org/2010/01/net-neutrality-economic-study-based-on-flawed-analysis/>